

Iodine Hall Thruster for Space Exploration, Phase II

Completed Technology Project (2013 - 2016)



Project Introduction

In the Phase I program, Busek Co. Inc. tested an existing Hall thruster, the BHT-8000, on iodine propellant. The thruster was fed by a high flow iodine feed system, and supported by an existing Busek hollow cathode flowing xenon gas. The Phase I propellant feed system was evolved from a previously demonstrated laboratory feed system. Throttling of the thruster between 2 and 11 kW at 200-600V was demonstrated. Testing has shown that the efficiency of iodine fueled BHT-8000 is the same as with xenon, with iodine delivering slightly higher thrust to power (T/P). Plume current was also measured at a variety of operating conditions. Preliminary design work for a new thruster to be built in Phase II was also completed. In Phase II a complete iodine fueled system will be developed including the thruster, hollow cathode, and iodine propellant feed system. The nominal power of the Phase II system is 8 kW. However, it can be deeply throttled as well as clustered to much higher power levels. The technology can also be scaled to >100 kW per thruster to support MW-class missions. The target thruster efficiency for the full scale system is 65% at high Isp (~3000 s) and 60% at high thrust (Isp~2000 s). These projections are based on Phase I testing and prior testing of higher power thrusters. Iodine enables dramatic mass and cost savings for lunar and Mars cargo missions, including Earth escape and near-Earth space maneuvers. High purity iodine is available commercially in large quantities at much lower cost than xenon. Iodine stores at 2 to 3 times greater density than xenon and at approximately one thousandth of the pressure and may be stored in low mass, low cost propellant tanks instead. Passive, long term storage of a fully fueled system is feasible including storage in conformal tanks which may be used to shield internal components against some types of space radiation.



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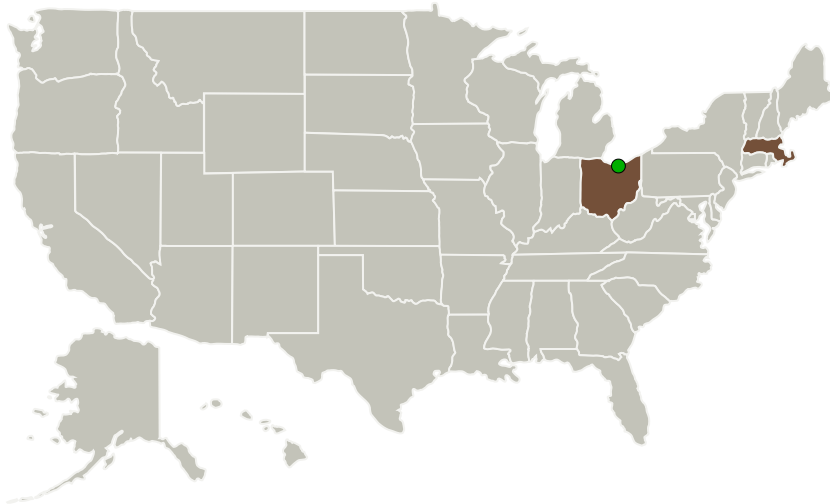
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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Busek Company, Inc.	Lead Organization	Industry Women-Owned Small Business (WOSB)	Natick, Massachusetts
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations

Massachusetts	Ohio
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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Busek Company, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

James Szabo

Co-Investigator:

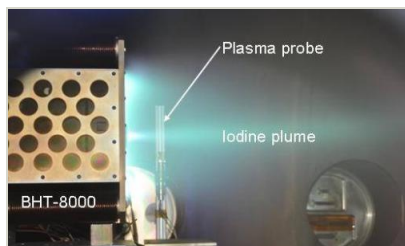
James Szabo

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Images



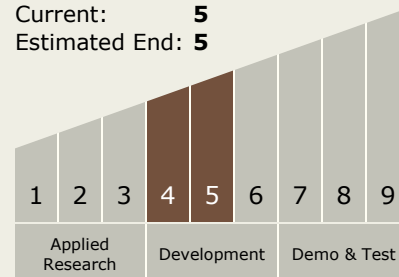
Briefing Chart

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(<https://techport.nasa.gov/image/135183>)

Technology Maturity (TRL)

Start: 4
Current: 5
Estimated End: 5



Technology Areas

Primary:

- TX01 Propulsion Systems
 - TX01.2 Electric Space Propulsion
 - TX01.2.2 Electrostatic

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System